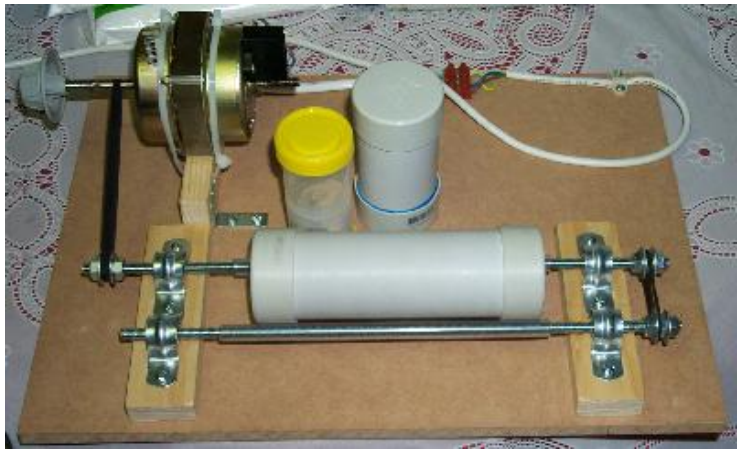
Ball Mill

2003-08-02



I constructed this simple ball mill to crush egg shells for my Lorikeet. It should also be very handy for crushing and mixing chemicals for my other experiments.

The rollers/shafts are 5/16" booker bolt from the hardware store. Some soft PVC pipe of ID just larger than the 5/16" bolt is used to give a gripping surface. The saddles hold 8mm/22mm/7mm ball bearings which I purchased from Small Parts & Bearings (an absolutely fantastic Australian company located in Queensland) they carry just about every kind of bearing conceivable, or can get it made for you. The bearings were from their huge surplus collection, quite cheap at about $1.

Extra 5/16" hardware holds the booker bolt in place, a nut is tightened each side of the bearings to locate them and avoid vibration loosening. More hardware is used to form pulleys for the drive belts. The belts are turntable drive belts I found at DSE, they were quite expensive, about $15 for the pack, but it contained many more than I used.

The 50 W electric motor is from a pedestal fan, originally used for extra ventilation in my ISPs racks. The motor had ceased up because the rear bush filled with dust which soaked out the lubricant. I stripped and rebuilt the motor for this project. Like most electric fans it is a squirrel-cage induction motor. It doesn't offer much starting torque, but it is sufficient for this application. It was designed for three speeds in its original service, I am using the lowest.

All hardware and sundry materials like the pine and MDF were purchased from Bunnings, although I did have to go to their big store in Belrose (in the Austlink Corp Park), as the Warringah Mall store was out of stock of some things. The big Bunnings is like a candy store for hardware geeks! They didn't have replacement blades for my bandsaw, which was disappointing, but they did have bulk fibreglass resin which made up for that. :-)

The bottles are made from 50 mm PVC water pipe, with end caps. For grinding the bird's food I used the chrome-steel balls, to avoid getting lead into the mix. For other grinding, lead fishing sinkers work very well, although the holes in the

© 2000 - 2009 Alan Yates - All Rights Reserved.

middle do collect material. I guess you could melt and re-cast the sinkers in bullet molds to avoid this. The shape isn't that important, spheres work OK, but so do cylinders, the mass of lead seems to help. Lead is also non-sparking if I ever want to grind blackpowder. Glass marbles work well for mixing, as does no grinding media at all. I tried taping two 75 ml sample bottles together, base-to-base, which worked very well, giving two disposable chambers. I have a huge quantity of such bottles, I purchased a case from Crown Scientific. Such bottles work well for liquid mixing, not just powders.

If you do build your own, note that they are very loud! Mine is about 85 dBA with a big bottle of lead balls. Grinding unstable compounds can lead to massive explosions that scatter bottle fragments and balls like a grenade. Grinding metals can lead nasty surprises when hot metal powder is first exposed to the air (it will consume all the oxygen in the bottle slowly as it warms up, but as it is shaken and oxygen added while it is still hot the resulting fuel-air mixture can ignite or even detonate). The same is true for organics, not just metals, but metals are particularly energetic and treacherous. Putting the entire unit outside or in a box in a garage or other isolated room is a good idea, purely for the noise generated, but especially if you are grinding flammable or oxidizer-fuel mixtures. At the very least remotely start and stop the ball mill when grinding nasty chemicals, and let it cool before opening. Consider what would happen if the contents ignited, allow the lid to blow off rather than bottle fragmentation, screw top lids are a potential bomb.

Of course if you are just grinding egg shells none of this applies, but I'd imagine this site will take a lot of hits from Google searches for pyrotechnics, which is a common use of homebrew ball mills. If you attempted to ball mill flash powder you'd likely end up in the morgue, however black powder is OK provided you take the obvious safety precautions.

45 comments.

© 2000 - 2009 Alan Yates - All Rights Reserved.